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**Breach of Trust in Takeovers
and the Optimal Corporate Charter**

Monika Schnitzer

No. 92-10

Feb. 1992

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technology**

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Breach of Trust in Takeovers and the Optimal Corporate Charter

Monika Schnitzer*

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* University of Bonn, visiting scholar at the Massachusetts Institute of Technology. This paper is based on Chapter 4 of my dissertation which was written within the European Doctoral Program in Quantitative Economics at Bonn University. I am grateful to participants of the Tilburg Conference on Information Economics and seminars at Boston University, MIT, University of Pennsylvania, University of Princeton, University of California at San Diego and University of California at Berkeley. I want to thank in particular David Canning, Oliver Hart, Bengt Holmström, Georg Nöldeke, Klaus Schmidt and Urs Schweizer for many helpful comments and discussions. The usual disclaimer applies.

Abstract: This paper analyzes how takeovers and takeover defenses affect the value of target companies, using an incomplete contracts framework. We consider a raider who intends to improve the efficiency of production and to appropriate the rents enjoyed by stakeholders of the company. Anticipating this rent shifting the stakeholders invest too little in relationship specific assets which may offset the ex post value increase. Our main focus is on how the corporate charter should be designed to mitigate these inefficiencies. We show that shareholders can use poison pills and golden parachutes to solve the underinvestment problem without forgoing profitable takeovers.

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1 Introduction

The takeover wave of the eighties has roused a very controversial debate on their pros and cons. Proponents of a liberal takeover policy argue that takeovers are important to reorganize a company more efficiently and to discipline or even replace sluggish managers.¹ But a number of critics have challenged this view. Their main objection is that takeovers are often used to appropriate rents enjoyed by stakeholders, like workers, managers or suppliers of the firm.² This “breach of trust”, so the argument, has negative implications not only for the stakeholders, but also for the owners of the company. However, it remains unclear why exactly shareholders should be negatively affected if stakeholders lose their rents. The empirical evidence suggests that shareholders of target companies typically make huge gains when their company is taken over. What is puzzling, though, is that there have been many incidences where shareholders approved of takeover defenses like poison pills, thus apparently forgoing potential gains from takeovers.

Despite the attention the recent takeover activity has received the theoretical foundations for evaluating takeovers and takeover defenses are still rather thin. The purpose of this paper is to develop a formal framework in which the arguments given above can be made precise, and to explore whether they can account for the puzzling empirical evidence. We argue that the stakeholders’ rents may have a positive impact on their incentive to undertake relationship specific investments, and we investigate the role of poison pills in protecting these rents and thus promoting investment incentives.

Poison pills would not be necessary if the shareholders could give the stakeholders optimal investment incentives by writing complete contingent contracts. However, if complete contracts are not feasible, this may be impossible. It is well known that in a world of incomplete contracts the choice of the governance structure (Williamson, 1985) has an important impact on economic behavior and efficiency. The recent theoretical literature on governance structures has been very much influenced by Grossman and Hart’s (1986) seminal article on the optimal allocation of ownership rights in a vertical relationship. Their major innovation was to define “ownership” of an asset as the “residual right

¹This view reflects the theory of the market for corporate control. In a seminal article Manne (1965) pointed out that the separation of ownership and control in modern companies gives rise to incentive problems which can be overcome by the threat of takeovers as a form of external competition for control.

²See e.g. Shleifer and Summers (1988).

to control” this asset in all contingencies which have not been dealt with in an explicit contract before. Almost all of the subsequent literature followed Grossman and Hart in focusing on the allocation of asset ownership. However, a governance structure may be more complex than just the institution of ownership. We argue that also the corporate charter should be seen as part of the governance structure of a company. In the corporate charter the shareholders determine to what extent they delegate their residual rights of control, e.g. the right to use poison pills as takeover defenses.

To simplify the analysis we focus on only one group of stakeholders, the top managers. We use a standard principal agent framework to model explicitly the rent the manager derives from his employment and how this rent affects his incentive to make relationship specific investments. We show first that if takeovers lead to an expropriation of this rent, then the anticipation of a takeover causes underinvestment in relationship specific assets. Since takeovers may increase the efficiency of production ex post, shareholders face a tradeoff between ex ante and ex post efficiency distortions. This result highlights that takeovers cannot be evaluated only on the basis of the value increase induced by the actual takeover, because this value increase does not reflect what the potential value might have been if the threat of a takeover had not induced the manager to underinvest.

Then we investigate how to design the corporate charter to overcome the underinvestment effect. We demonstrate that poison pills together with golden parachutes can prevent rent shifting without preventing ex post profitable takeovers. Suppose the manager is given the right to fight takeovers with poison pills. If the shareholders want the takeover to succeed, they have to make sure that the manager does not object to it, i.e. they have to compensate him for the rents he is going to lose with a golden parachute. Since his rents are protected, the possibility of a takeover does not affect the investment incentives.

We show that from the point of view of social welfare it is always desirable to design the corporate charter such that rent shifting and underinvestment are avoided. However, from the shareholders’ perspective this may be different. If the shareholders participate in the profits generated by rent shifting in form of a higher takeover price, and if this outweighs the losses due to underinvestment, then the shareholders may opt not to protect the manager’s rents. In fact, their incentive to participate in rent shifting

may be so large that they may encourage even ex post inefficient takeovers. In this case rent shifting gives rise to both ex ante and ex post inefficiencies.

Most of the theoretical literature has focused on takeovers as an instrument to discipline managers in their production decision in order to enhance the value of the company (Grossman and Hart 1980, Scharfstein 1988). In these models it is not in the interest of the shareholders to allow takeover defenses (unless they serve to increase the takeover price). This view is questioned by Laffont and Tirole's (1988) study of a dynamic regulation problem which they apply to a takeover context. They investigate the incumbent's (manager's) incentives to invest in future cost saving if the regulator (shareholders) might switch to a second source (raider) later on. It turns out that the regulator might prefer to commit to a switching rule which favors the incumbent (takeover defenses) in order to improve his investment incentives. Thus takeover defenses may actually enhance the value of the company. Our approach differs from the one of Laffont and Tirole in that we interpret takeover defenses as residual rights of control in the spirit of the incomplete contracts approach rather than as an instrument with which to manipulate the takeover probability. If the corporate charter allows the manager to use poison pills, then this right protects the manager's interests but, in contrast to Laffont and Tirole's model, poison pills are never used in equilibrium.

The rest of this paper is organized as follows: In Section 2 we introduce the model and discuss the assumption of incomplete contracts. In Section 3 we study how anticipated takeovers affect the manager's investment incentives. In Section 4 a model of the tender procedure is introduced which endogenizes the takeover price and takeover probability. In Section 5 we discuss the optimal choice of the corporate charter from the point of view of the shareholders and of social welfare. Section 6 concludes.

2 The Model

2.1 The General Framework

We start with an overview of the general framework and fill in the details of the model a little bit later. Consider a company that is owned by a large number of shareholders

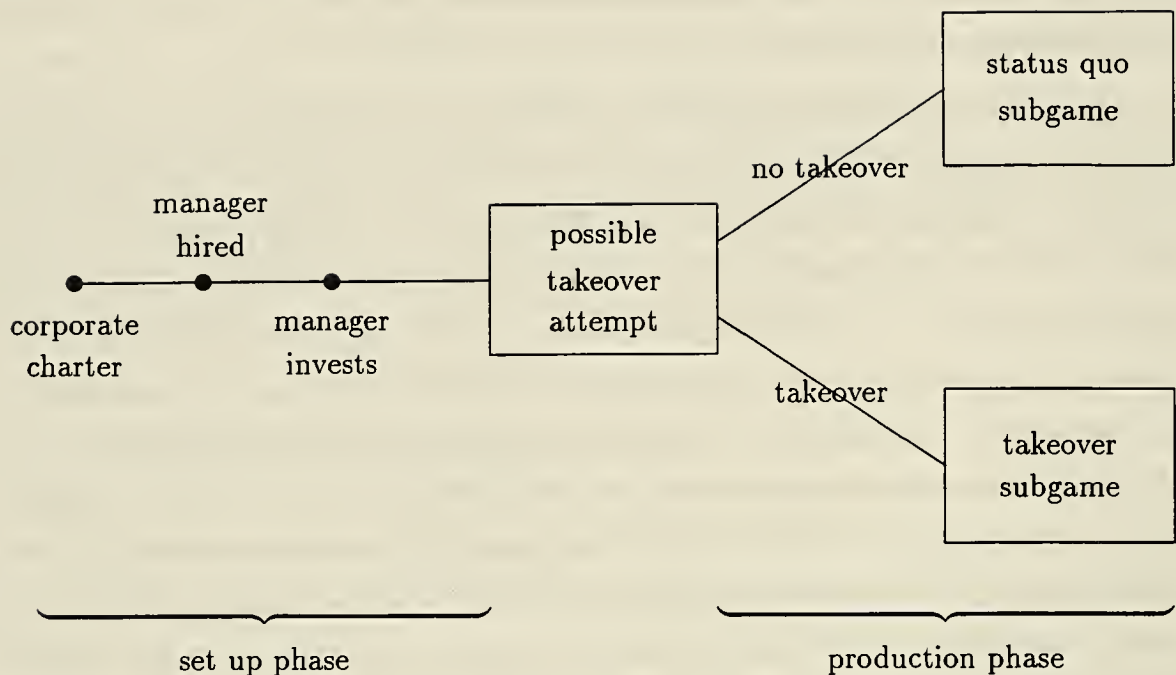


FIGURE 1: The time structure of the model.

who need a manager to carry out production. Shareholders and manager are engaged in a dynamic principal-agent relationship. We distinguish two phases of activities within the life of the company, a set up phase and a production phase. In the set up phase, the manager decides on the level of relationship specific investments that reduce the expected costs of production later on. For example he spends some effort to set up the firm, to design the product or to organize production. This investment is assumed to be observable, but not verifiable at the end of the set up phase.

In the production phase the manager has to spend effort on production. The more he invested in the set up phase the less effort he has to spend now for any given level of production. Before he chooses an effort level the manager receives private information about the state of the world which determines the productivity of his ex ante investment. The manager can exploit his informational advantage to get an information rent which gives him a better incentive to invest in the first place.

Between the two phases, i.e. after the manager's investment costs are sunk but before the production phase starts, a raider can launch a hostile takeover attempt. If the

takeover succeeds the raider can expropriate the manager's quasi-rent but he may also increase the efficiency of production. The simplest way to model both effects is to assume that the raider fires the manager and becomes owner-manager himself.³

The shareholders can influence the takeover price and the takeover probability through the design of the corporate charter, e.g. by introducing poison pills or by facilitating dilution.⁴ The corporate charter is usually written by a few founding shareholders when the company is set up, before they sell shares to a large number of other shareholders. This corporate charter will be specified in detail in Section 5. The time structure of our model is illustrated in Figure 1.

The central contractual assumption of our model follows closely the incomplete contracts approach initiated by Grossman and Hart (1986).

Assumption 1 *In the set up phase, no contingent contracts can be written, i.e. no contracts that condition on anything that happens in the production phase.*

How can this assumption be justified? Clearly, the contract cannot condition on the state of the world or the manager's effort level in the production phase, because these are private information of the manager. Nor can the manager's investment level be contracted upon. Although the investment is observable it is not verifiable, i.e. it is impossible to specify it in a contract in such a way that it can be verified unambiguously to an outsider like the courts. For the other variables the argument is slightly more subtle. We explicitly assume that contingent contracts on, say, the production level are feasible at the beginning of the production phase, but that the same contracts could not be written in the set up phase. The idea is that in the set up phase the production technology and the type of product to be produced in the future may depend on the realization of a rather complex state of the world (not modelled explicitly) which may be very costly if not impossible to specify

³An alternative scenario would be that the raider keeps the manager but offers a more efficient contract because he can observe the realization of the state of the world.

⁴Poison pills are introduced with the intention to make a company "indigestible" for a raider. A poison pill may for example oblige the raider to make huge payments to the shareholders or the creditors of the company in case of a hostile takeover, such that the takeover becomes too costly. Dilution is explained in detail in Section 4.

in a contract. This will be much simpler once the production technology and the final design of the product are clear, i.e. in the beginning of the production phase.⁵

Let us now describe the model in some more detail.

2.2 The Set Up Phase

In the set up phase the manager is hired from a competitive market for managers. At this stage the shareholders can offer him only a fixed wage contract. The manager will accept any contract that gives him at least his outside option utility which we normalize to zero. The manager then makes his relationship specific investment i which is measured in units of (non-monetary) disutility, (i.e. the investment level i causes the manager a disutility i).

At the end of the set up phase a hostile takeover occurs with probability q . In Section 4 we specify a tender procedure which determines endogenously takeover price and takeover probability.

2.3 The Production Phase

Status Quo Subgame (S)

If no takeover occurs, production is carried out by the manager. We think of production in terms of “producing” a profit y , i.e. y is the total profit of the firm net of all production costs except for the manager’s wage. To produce y the manager has to spend some effort e which is not observable. This effort is measured in units of (non-monetary) disutility to the manager. The productivity of his effort depends on his ex ante investment and on the realization of a random variable θ , called the state of the world, which is observed by the manager before he takes his effort decision but which is not observable by the shareholders. For simplicity we assume that there are only two states of the world, a bad state θ_1 and a good state θ_2 , drawn by nature with probability $(1 - \mu)$ and μ , respectively. They may be thought of as the demand situation, a parameter of the firm’s cost function

⁵Note that the assumption that the production level cannot be contracted upon in the set up phase but may be contractible in the production phase is exactly the same as the assumptions on the contractibility of “ q ” in Grossman and Hart (1986). For a more formal justification see their footnote 14.

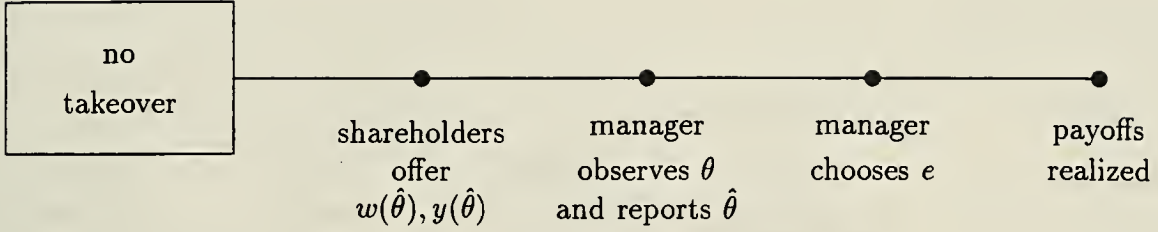


FIGURE 2: The time structure of the status quo subgame.

or any other industry specific parameter. The time structure of the status quo subgame is shown in Figure 2.

At the beginning of the status quo subgame, but before the manager learns about the state of the world, the shareholders offer the manager a contract as a take-it-or-leave-it offer. Using the revelation principle, we model this contract as a direct mechanism. This means that the contract specifies a wage and a production level conditional on the manager's report, $\hat{\theta}$, about the state of the world. The wage $w(\hat{\theta})$ and the production level $y(\hat{\theta})$ are chosen such that the manager is always induced to announce the state of the world truthfully. If the manager rejects this contract no production takes place and he gets his outside option utility. If he accepts he observes the realisation of θ and announces $\hat{\theta}$. Then he chooses some unobservable effort e and receives $w(\hat{\theta})$ if he produces $y(\hat{\theta})$.

Takeover Subgame (T)

Let us now turn to the situation where a raider has taken over the company. In this case we assume that the raider fires the manager and becomes owner-manager himself, i.e. he observes θ and carries out production himself. To save notation, we assume that the raider has the same function of disutility of effort as the incumbent manager. The time structure of the takeover subgame is given in Figure 3.

All players are assumed to be risk neutral and to maximize their expected utilities. In principle, the shareholders could overcome all problems that arise from asymmetric information by making the manager residual claimant and extracting his expected profit as a lump sum payment ex ante. We exclude this possibility with the assumption that the manager is wealth constrained, so that he cannot pay a lump sum transfer in advance.

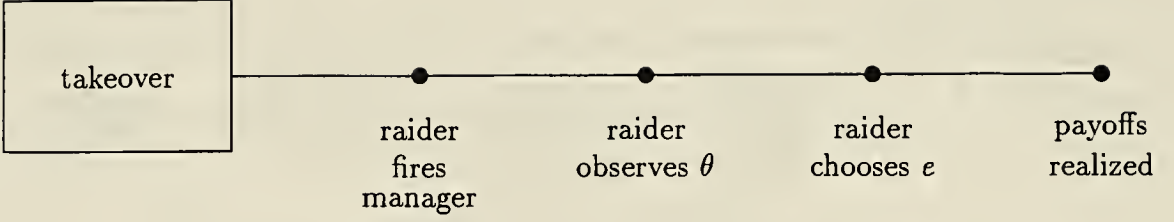


FIGURE 3: The time structure of the takeover subgame.

Furthermore, we assume that he is subject to only limited liability.⁶ This implies that if the manager chooses, in any state of the world, not to fulfill the contract he has signed he can be punished only to a limited extend. For expositional convenience, we focus on the special case of zero liability which means that he cannot be punished at all but is free to leave the firm and take his outside option. Thus, if he does not fulfill his contract, the manager receives a wage of zero. His utility function is assumed to be additively separable and is given by

$$U = w - e - i . \quad (1)$$

The value of the firm in the production phase is given by

$$V = y - w . \quad (2)$$

Finally we make the following technological assumptions.

Assumption 2 *Let $e(y, i, \theta)$ be the minimal effort necessary to produce the profit y given the investment level i and the state of the world θ . Then for all $y > 0$, $i > 0$, $\theta \in \{\theta_1, \theta_2\}$, $e(y, i, \theta)$ is twice continuously differentiable and*

$$(2.0) \quad e(y, i, \theta_1) > e(y, i, \theta_2).$$

$$(2.1) \quad e(y, i, \theta) \text{ is strictly increasing and convex in } y, \text{ with } e(0, i, \theta) = 0 \text{ and } e(y, 0, \theta_1) < \infty \text{ if } y < \infty. \text{ There may be a discontinuity at } y = 0 \text{ due to fixed costs. Furthermore, there exists a } y > 0 \text{ such that } y > e(y, i, \theta_1).$$

$$(2.2) \quad e_y(y, i, \theta_1) > e_y(y, i, \theta_2) \text{ and } e_{yy}(y, i, \theta_1) > e_{yy}(y, i, \theta_2).$$

⁶See Sappington (1983).

(2.3) $e(y, i, \theta)$ is decreasing in i .

(2.4) $e_i(y, i, \theta_1) > e_i(y, i, \theta_2)$.

(2.5) $e_{yi}(y, i, \theta) = 0$.

Assumptions (2.0) and (2.1) guarantee that there is an interior solution for the first best production level in both states of the world. According to the first part of (2.2) not only total costs but also marginal costs are higher in the bad state of the world. This “single crossing property” is a standard assumption in the mechanism design literature. The second part of (2.2) ensures that the second order conditions are satisfied. (2.3) and (2.4) say that the cost reducing effect of the investment is higher in the good state of the world than in the bad state of the world. (2.5) together with (2.3) implies that the investment reduces only fixed production costs but not marginal production costs. This assumption ensures (together with assumption (2.1) and (2.2)) that the manager’s rent is monotonically increasing in his investment. Without assumption (2.5) we would have to make assumptions on third derivatives of the cost function, which do not have an intuitive interpretation in our set-up, in order to get unambiguous results.

3 Rent Shifting and Efficiency

In this section we analyze the status quo and the takeover subgame and the impact of the takeover probability on the manager’s investment incentives. As a point of reference let us determine the first best levels of production for a given investment i .

$$(y_1^{FB}, y_2^{FB}) = \arg \max_{y_1, y_2} \{W = (1 - \mu) \cdot (y_1 - e(y_1, i, \theta_1)) + \mu(y_2 - e(y_2, i, \theta_2))\} \quad (3)$$

Given Assumption 2.1, y_1^{FB} and y_2^{FB} are strictly positive and uniquely defined by the following first order conditions:

$$e_y(y_j^{FB}, i, \theta_j) = 1, \quad j \in \{1, 2\}. \quad (4)$$

3.1 Production in the Status Quo Subgame

The shareholders’ problem is to design a contract that maximizes the value of the company subject to the constraint that it is optimal for the manager to accept and fulfill the

contract.⁷ They know that at this stage the manager's investment costs are sunk and thus not relevant for his decision to accept the contract. Since they observe the investment i , they can take its impact on the manager's effort cost into account.

To determine the optimal contract we do not have to investigate the class of all feasible contracts but can refer to the revelation principle (Myerson, 1979) and restrict attention to the class of all "direct mechanisms". In our context a direct mechanism is a contract $\{w(\hat{\theta}), y(\hat{\theta})\}$ saying that if the manager announces the state of the world to be $\hat{\theta}$ he has to produce $y(\hat{\theta})$ and gets the payment $w(\hat{\theta})$. A direct mechanism has to be incentive compatible, that is given the scheme $\{w(\hat{\theta}), y(\hat{\theta})\}$ it must be optimal for the manager to announce the state of the world truthfully. By the revelation principle it is well known that the optimal direct mechanism truthfully implements the best possible outcome the shareholders can attain from any other contract, no matter how sophisticated it may be.

Let $y_j = y(\theta_j)$ and $w_j = w(\theta_j)$ with $j \in \{1, 2\}$. The maximization problem of the shareholders can then be stated as the following program:

$$\max_{y_1, y_2, w_1, w_2} V = (1 - \mu)[y_1 - w_1] + \mu[y_2 - w_2] , \quad (5)$$

subject to

$$\text{IC1:} \quad w_1 - e(y_1, i, \theta_1) \geq w_2 - e(y_2, i, \theta_1) ,$$

$$\text{IC2:} \quad w_2 - e(y_2, i, \theta_2) \geq w_1 - e(y_1, i, \theta_2) ,$$

$$\text{IR1:} \quad w_1 - e(y_1, i, \theta_1) \geq 0 ,$$

$$\text{IR2:} \quad w_2 - e(y_2, i, \theta_2) \geq 0 .$$

The first two conditions (incentive compatibility constraints) guarantee that the manager announces θ truthfully. The second two conditions (individual rationality constraints) are necessary to make sure the manager will accept and fulfill the contract.⁸

⁷Since all shareholders have the common objective to maximize the value of their company we can think of this contract offer as being made by one representative shareholder.

⁸The assumption of limited liability implies that a contract that does not satisfy both conditions cannot be enforced, even if it is accepted. If only one of the two conditions holds the manager might accept with the intention to fulfill the contract only in that state of the world for which the condition is

Proposition 1 *An interior solution $(y_1^S, y_2^S, w_1^S, w_2^S)$ of the shareholders maximization problem is uniquely defined by the following four equations*

$$w_1^S = e(y_1^S, i, \theta_1) , \quad (6)$$

$$w_2^S = e(y_2^S, i, \theta_2) + e(y_1^S, i, \theta_1) - e(y_1^S, i, \theta_2) , \quad (7)$$

$$e_y(y_1^S, i, \theta_1) = 1 - \mu[1 - e_y(y_1^S, i, \theta_2)] , \quad (8)$$

$$e_y(y_2^S, i, \theta_2) = 1 . \quad (9)$$

The corresponding expected equilibrium profit of the firm,

$$V^S = (1 - \mu)[y_1^S - w_1^S] + \mu[y_2^S - w_2^S], \quad (10)$$

is increasing in i , since

$$\frac{\partial w_1^S}{\partial i} < 0 , \quad \frac{\partial w_2^S}{\partial i} < 0 , \quad \frac{\partial y_1^S}{\partial i} = 0 , \quad \frac{\partial y_2^S}{\partial i} = 0 . \quad (11)$$

Proof: See appendix.

In the following we focus on the case where this interior solution is indeed optimal.⁹

Note that the optimal mechanism has the following properties.

- The manager is fully compensated for his production costs. Additionally he receives an information rent $[e(y_1^S, i, \theta_1) - e(y_1^S, i, \theta_2)]$ in the good state of the world which is necessary to induce him to announce θ_2 truthfully. This information increases with i , since $[e_i(y_1^S, i, \theta_1) - e_i(y_1^S, i, \theta_2)] > 0$ by Assumption 2.4.
- The optimal incentive scheme induces efficient production in the good state of the world ($y_2^S = y_2^{FB}$) and inefficiently low production in the bad state ($y_1^S < y_1^{FB}$). Of course, the shareholders could implement the first best production level in the bad

satisfied. Of course, such a contract may be optimal. However, in this case the shareholders could have offered another contract, in which there is no production and no payment in that state of the world, so that the contract would be “fulfilled” by the manager and would yield the same payoff for shareholders.

⁹If a corner solution yields a higher payoff to the shareholders than the interior solution then the shareholders will offer no production and no wage if the bad state is announced and y_2^S and $w_2^S = e(y_2^S, i, \theta_2)$ in the good state. In this case the manager does not get an information rent in the good state. However, in a more general model, in which θ is drawn from a larger set $\{\theta_1, \theta_2, \dots, \theta_n\}$ the expected information rent of the manager is always positive as long as there is more than one state of the world with a positive level of production. See Sappington (1983).

state as well. But then they would have to pay the manager a higher information rent in the good state to prevent him from announcing the bad state. The optimal contract trades off the efficiency loss in the bad state and the information rent necessary to induce truthtelling in the good state.

- The shareholders are aware that the manager's investment reduces his effort costs and opportunistically exploit the fact that investment costs are sunk. Thus, the higher the investment the lower the wages they offer. However, they cannot fully appropriate the returns on the investment because the productivity of the investment depends on the state of the world which they cannot observe. So the returns on the investment are shared by shareholders and manager.

3.2 Production in the Takeover Subgame

Let us now turn to the case in which a takeover occurred after the set up phase. What can the raider do better than the shareholders? To keep the model as simple as possible we have assumed that the raider fires the manager and, after having observed θ , carries out production himself.¹⁰ An alternative specification would be to assume that the raider keeps the manager, but that he is able to observe θ after he has bought the company (or, more generally, he is better informed about the relevant state of the world than shareholders are). In both cases the manager loses his information rent after the takeover (at least partially).

Both specifications induce the following value increases: In the bad state the raider implements the efficient production level y_1^{FB} yielding an efficiency gain which increases profits. In the good state he can raise profits by appropriating the information rent the manager would otherwise enjoy. Thus the expected value of the firm in the takeover subgame is

$$V^T = V^S + E + R, \quad (12)$$

where

$$E = (1 - \mu)\{[y_1^{FB} - e(y_1^{FB}, i, \theta_1)] - [y_1^S - e(y_1^S, i, \theta_1)]\} \quad (13)$$

¹⁰The investment stays in the company when the manager leaves. It should be thought of as an investment in the firm's organization rather than in human capital.

denotes the expected efficiency gain from choosing the first-best production level in state θ_1 and

$$R = \mu[e(y_1^S, i, \theta_1) - e(y_1^S, i, \theta_2)] \quad (14)$$

denotes the expected information rent the manager would have enjoyed in state θ_2 . Note that $\frac{dR}{di} > 0$ due to Assumption 2.4. Note further that $\frac{dE}{di} = 0$ since $\frac{dy}{di} = 0$ by Proposition 1 and $e_{yi} = 0$ by Assumption 2.5.

3.3 The Underinvestment Effect

Consider now the manager's investment decision in the set up phase. The shareholders' problem is that they cannot directly compensate the manager for his investment because it is not verifiable. In addition, any indirect compensation contract which conditions on future realization of the company's profits is ruled out by the incomplete contracts assumption. Therefore the manager's incentive to undertake relationship specific investments comes only from his expected information rent. Let $i^{SB} = \operatorname{argmax}\{R(i) - i\}$ denote the second best investment level given the incomplete contract setting.

Note that i^{SB} is too low. Given y_1^S, y_2^S , the first best investment level i^{FB} maximizes

$$W(i) = (1 - \mu)(y_1^S - e(y_1^S, i, \theta_1)) + \mu(y_2^S - e(y_2^S, i, \theta_2)) - i. \quad (15)$$

By Assumptions 2.5 and 2.3 we have

$$\begin{aligned} \frac{d}{di}[W(i)] &= -(1 - \mu)e_i(y_1^S, i, \theta_1) - \mu e_i(y_2^S, i, \theta_2) - 1 > \\ \frac{d}{di}[(R(i) - i)] &= \mu[e_i(y_1^S, i, \theta_1) - e_i(y_1^S, i, \theta_2)] - 1 \end{aligned} \quad (16)$$

for all $i \geq 0$. Suppose $i^{FB} < i^{SB}$. Since $i^{FB} \in \operatorname{argmax} W(i)$, it must be the case that $W(i^{FB}) \geq W(i^{SB})$. On the other hand $i^{SB} \in \operatorname{argmax} [R(i) - i]$, so we have $R(i^{SB}) - i^{SB} \geq R(i^{FB}) - i^{FB}$. Combining these two inequalities yields

$$W(i^{FB}) - R(i^{FB}) + i^{FB} \geq W(i^{SB}) - R(i^{SB}) + i^{SB}. \quad (17)$$

However, by (16) $W(i) - R(i) + i$ is strictly increasing in i , a contradiction.

How do takeovers affect the manager's investment? The manager rationally anticipates what will happen in the production phase. If there is no takeover, he keeps his

job and receives an information rent in the good state of the world whereas in case of a takeover he gets only his outside option utility. Therefore his expected utility as a function of his investment is given by

$$U = (1 - q)R(i) - i . \quad (18)$$

Suppose that the takeover probability q is exogenously given. Proposition 2 summarizes the impact of a potential takeover on the manager's investment decision.

Proposition 2 *An optimal investment level $i^*(q)$ which maximizes (18) exists for all $q \in [0, 1]$. Furthermore $i^*(q)$ is decreasing in q and so is V^S .*

Proof: Note that $R(i)$ is continuous in i and that for any given y_1^S $R(i)$ is bounded above because by Assumption 2.1 $e(y_1^S, i, \theta_1)$ is bounded above and $e(y_1^S, i, \theta_2) \geq 0 \forall i \geq 0$. Therefore (18) must have a maximum. We prove the second part of the proposition using a simple revealed preference argument. Take any $q', q'' \in [0, 1]$, $q' < q''$. Let $i' \in \arg \max_i U(i, q')$ and $i'' \in \arg \max_i U(i, q'')$.

By the definitions of i' and i'' we know that

$$(1 - q')R(i') - i' \geq (1 - q')R(i'') - i'' \quad (19)$$

and

$$(1 - q'')R(i'') - i'' \geq (1 - q'')R(i') - i' . \quad (20)$$

Thus

$$[(1 - q') - (1 - q'')]R(i') \geq [(1 - q') - (1 - q'')]R(i'') . \quad (21)$$

Since $q' < q''$ and $R(i)$ is strictly increasing in i by Assumption 2.4 it follows that $i' \geq i''$. $V^S(i)$, which is strictly increasing in i by Proposition 1, is therefore decreasing in q as well. Q.E.D.

Proposition 2 shows that anticipated takeovers may cause underinvestment in relationship specific assets as compared to the second best characterized above and thus aggravate the efficiency distortion of the manager's investment decision. This underinvestment has a negative impact on the company's potential value V^S . In the previous section we have shown that a raider can increase the value of the company ex post, for a given

level of investment, through rent shifting and enhancing the efficiency of production. But Proposition 2 makes clear that the costs and benefits of takeovers cannot be judged only on the basis of this ex post value increase since it does not reflect the reduction in value ex ante. If the underinvestment effect is strong enough it may offset the shareholders' potential gains from selling their company.

4 The Tender Procedure

In this section we model the raider's tender offer and the shareholder's strategies with respect to this offer explicitly in order to determine takeover price and takeover probability endogenously.

We assume that the target company is owned by N small shareholders each of whom holds one single share. The raider makes a conditional offer π for each share that is tendered. This means that the raider buys the tendered shares only if he can acquire at least the majority of all shares to gain control of the company. Such conditional tender offers are common practice on the market for corporate control.

For his takeover attempt, the raider has to incur transaction costs t . Ex ante t is a random variable, with support $[0, \bar{t}]$, and is distributed according to the cumulative distribution function $F(t)$ which is assumed to have a continuous and strictly positive density $f(t)$.

Given the tender offer π , each shareholder has to decide individually whether or not to tender. We assume that the number of shareholders is so large that each individual shareholder neglects the influence of his tender decision on the takeover success.¹¹

What are the payoffs of this tender game? Consider first an individual shareholder and suppose the takeover succeeds. If he tendered his share, he gets π . If he did not, his payoff is the expected value of his minority share. This value may differ from V^T/N because if a raider succeeds in acquiring the majority of all shares he might dilute the value of the company for his own benefit but at the expense of minority shareholders.¹² The

¹¹This assumption is made in most tender models, starting with Grossman and Hart (1980).

¹²For instance he can pay himself a wage that exceeds the market wage or he can sell assets of the company under value to another company he owns.

extent to which he can do this is determined by corporate law and the corporate charter. Let d denote the maximum possible level of dilution. Then the value of a minority share is $\frac{V^T - d}{N}$, because the raider will always dilute as much as possible. Suppose the takeover does not succeed. In this case the shareholder's payoff is $\frac{V^S}{N}$, irrespective of his tender decision, since the tender offer is conditional.

The raider's payoff depends on the number of tendered shares. If $n > \frac{N}{2}$ shares are tendered, the takeover succeeds and his payoff is

$$n \left(\frac{V^T - d}{N} - \pi \right) + d - t. \quad (22)$$

If $n \leq \frac{N}{2}$ shares are tendered, the takeover attempt fails and the raider's payoff is $-t$.

Note that an offer $\pi < \frac{V^T - d}{N}$ has no chance to succeed. This is due to the free rider problem which was first analyzed by Grossman and Hart (1980). Since each individual does not consider his own tender decision to be decisive, it is a weakly dominant strategy to hold out.

To exclude so called “no trade”-equilibria in which the takeover fails although everybody weakly prefers to tender, we restrict attention to equilibria in undominated strategies.

Proposition 3 *If $d > t$, then there is a unique subgame perfect equilibrium outcome of the tender game in which the raider offers $\pi^* = \frac{V^T - d}{N}$ and the takeover succeeds. Equilibrium payoffs are $d - t$ for the raider and $\pi^* = \frac{V^T - d}{N}$ for each shareholder.*

Proof: See Appendix.

The aggregate payoff for all shareholders is $\Pi = N\pi^*$. If $d < t$, the raider cannot make a profitable tender offer. Hence, the ex ante probability of a takeover in equilibrium is $q = \text{prob}(d - t \geq 0) = F(d)$.

Note that this ex ante probability does not depend on the value of the company after a takeover. This implies that the manager does not influence the likelihood of a

takeover with his investment decision. So Proposition 2, which characterized the optimal investment decision assuming an exogenously given q , holds also if q is determined endogenously. However, this is due to our particular specification of the maximum level of dilution d as a lump sum transfer from the company to the raider. We could more generally assume that d is an increasing function of the potential ex post value of the company. In this case the manager's investment would increase the possible level of dilution and thus the likelihood of a takeover. This would give an additional disincentive to invest and thus reinforce our underinvestment result of Section 3. However, to keep the model tractable we will stick to the simpler specification where d is a lump sum dilution.

5 The Optimal Corporate Charter

Now we can turn to the optimal choice of the corporate charter. We consider two instruments with which the shareholders can influence the takeover probability and the manager's investment incentives.

- (1) The shareholders choose the parameter d , i.e. the maximum level of dilution. By choosing d the shareholders can determine the takeover probability and affect the takeover price.¹³
- (2) They decide whether or not the manager is allowed to use takeover defenses. We distinguish two cases
 - (i) the manager is not allowed to use any poison pills at all (referred to as $p = 0$),
 - (ii) the manager is free to use poison pills and thus can make it virtually impossible for the raider to acquire the company (referred to as $p = 1$).

How will the shareholders use these instruments? The first step to answer this question is to determine the optimal level of dilution for a given p .

¹³Our tender model of Section 4 with free riding and dilution introduces in a natural way the policy variable d that can be influenced by the shareholders in their corporate charter. A possible alternative would be Holmström and Nalebuff's (1991) tender model where the raider's profits can be influenced by specifying in the corporate charter the necessary control majority.

Suppose the manager is not allowed to use poison pills ($p = 0$). Then the expected value of the firm as a function of d is

$$\begin{aligned}
V^e(d|p=0) &= (1-q)V^S(i) + q\Pi(i) \\
&= (1-q)V^S(i) + q(V^T(i) - d) \\
&= V^S(i) + [E + R(i) - d] \cdot F(d) .
\end{aligned} \tag{23}$$

Recall that E is independent of the manager's investment. Let

$$d_0 = \arg \max_d V^e(d|p=0) \tag{24}$$

The choice of d_0 is driven by three effects:

- a direct effect on the takeover price $\Pi = V^T - d$;
- a direct effect on the raider's profit, $d - t$, and thus on the takeover probability $F(d)$;
- an indirect effect on the manager's investment which is a decreasing function of the takeover probability. Recall that $V^S(i)$ and the takeover price $\Pi(i) = V^T(i) - d$ are increasing functions of i .

Suppose next the manager is allowed to use poison pills ($p = 1$). Does this prevent any takeover? Certainly not. Once the manager has made his investment the shareholders can "bribe" him not to use his poison pills. The idea is to offer him a golden parachute which compensates him for the expected information rent he forgoes in case of a takeover.¹⁴ This golden parachute G reduces the shareholders' expected profit from selling the company which is now $\Pi - V^S - G = E - d$. But as long as $E > d$ it pays to "bribe" the manager. As a consequence takeover attempts occur with positive probability, but poison pills are never used in equilibrium.

In contrast to the situation where $p = 0$ takeovers do not have a negative impact on the manager's investment. The reason is that the shareholders have to specify this golden parachute G only after the manager's investment has become observable. Thus they can use this observation to evaluate the expected information rent $R(i)$ given the

¹⁴The implicit assumption here is that the shareholders have all the bargaining power. This corresponds to our previous assumption that shareholders as the principal have all the bargaining power when making a contract offer to the manager. See footnote 7.

actual investment i , and choose the golden parachute $G(i)$ to match exactly the forgone rent. Since the manager receives $R(i)$ anyway, either as an information rent or as a golden parachute, he will choose the second best investment level i^{SB} .¹⁵ The expected value of the firm as a function of d is now given by

$$\begin{aligned} V^e(d|p=1) &= (1-q)V^S(i^{SB}) + q[\Pi(i^{SB}) - G(i^{SB})] \\ &= V^S(i^{SB}) + [E-d] \cdot F(d) . \end{aligned} \quad (25)$$

Let

$$d_1 = \arg \max_d V^e(d|p=1) \quad (26)$$

In contrast to the situation above the choice of d_1 affects only

- the takeover price as a function of d and
- the raider's profit and thus the takeover probability $F(d)$,

but it does not affect the investment level i^{SB} .

Proposition 4 summarizes the discussion of poison pills.

Proposition 4 *There are two candidates for a corporate charter which maximizes shareholders' profits:*

- *A corporate charter which allows the manager to use poison pills to protect his information rent induces second best investments. Given this corporate charter there will be a takeover attempt if and only if $t \leq d$ and $E \geq d$. In this case the shareholders offer a golden parachute $G = R(i)$ which the manager accepts and he does not use poison pills.*
- *A corporate charter which gives no control rights to the manager leads to underinvestment as compared to the second best. Under this corporate*

¹⁵Obviously, a golden parachute fixed before the investment has been taken would not do the job, since it cannot condition on the actual investment and thus would not have any effect on the manager's investment incentives. Note that our combination of poison pills and golden parachutes has an interesting parallel in the renegotiation literature. It is well known that renegotiation of ex post inefficient incentive schemes has a negative impact on ex ante efficiency. However, Hermalin and Katz (1991) have shown that this need not be the case if new information becomes available to the contracting parties after the contract has been written.

charter a takeover occurs if and only if $t \leq d$. In case of a takeover shareholders capture the manager's information rent in form of a higher takeover price.

Which of these two alternatives the shareholders will choose depends on the relative importance of the underinvestment effect and the gain from rent shifting, i.e. on the parameters of the model.

In the remainder of this section we contrast these two alternatives with the welfare maximizing corporate charter which is characterized in Proposition 5.¹⁶

Proposition 5 *Suppose d can be chosen continuously. Then the welfare maximizing corporate charter allows the manager to use poison pills, $p = 1$, and chooses $d_W = E$.*

Proof: Since $i^{SB} < i^{FB}$ and since distributional concerns are not relevant for welfare it is optimal to give the manager the best possible investment incentives. This is achieved by choosing $p = 1$. Thus $i = i^{SB}$. Given i^{SB} , the expected welfare as a function of d is

$$W^e = V^S(i^{SB}) + R(i^{SB}) - i^{SB} + \int_0^d [E - t] f(t) dt . \quad (27)$$

The first order condition for the optimal level d_W is

$$[E - d_W] f(d_W) = 0 . \quad (28)$$

This implies $d_W = E$. Since W^e is increasing in $d \forall d \leq E$ and decreasing in $d \forall d \geq E$ and since $f(d_W) > 0$ by assumption, the FOC uniquely characterizes a global maximum. *Q.E.D.*

This result has a very intuitive interpretation. The optimal level of dilution should be specified such that a takeover is carried out whenever the realization of the takeover cost t is smaller than the expected efficiency increase E .

Proposition 6 compares the welfare maximizing corporate charter with the two candidates for a privately optimal corporate charter.

¹⁶Welfare maximizing given the constraints of incomplete contracts, asymmetric information and that the manager cannot be made residual claimant.

Proposition 6 *Suppose the level of dilution can be chosen continuously.*

- a) *If the manager is allowed to use poison pills ($p = 1$), the privately optimal level of dilution can never exceed the socially optimal level, i.e. $d_1 \leq d_W$.*
- b) *If the manager is not allowed to use poison pills ($p = 0$), then the privately optimal level of dilution, d_0 , may exceed the socially optimal level, d_W .*

Proof: a) Consider the function

$$\begin{aligned}
 g(d) &= W^e(d) - V^e(d|p=1) \\
 &= V^S(i^{SB}) + R(i^{SB}) - i^{SB} + \int_0^d [E-t]f(t)dt - V^S(i^{SB}) - (E-d)F(d) \\
 &= R(i^{SB}) - i^{SB} + \int_0^d [E-t]f(t)dt - (E-d)F(d) .
 \end{aligned} \tag{29}$$

Note $g(d)$ is increasing since

$$\frac{\partial g(d)}{\partial d} = [E-d]f(d) - [E-d]f(d) + F(d) = F(d) \geq 0 . \tag{30}$$

Suppose $d_1 > d_W$. Since $d_1 \in \arg\max V^e(d|p=1)$ it must be true that

$$V^e(d_1|p=1) \geq V^e(d_W|p=1) . \tag{31}$$

Similarly, since $d_W = \arg\max W^e$ we have

$$W^e(d_W) > W^e(d_1) . \tag{32}$$

Combining (31) and (32) yields

$$g(d_W) = W^e(d_W) - V^e(d_W|p=1) > W^e(d_1) - V^e(d_1|p=1) = g(d_1) . \tag{33}$$

But this is a contradiction to the fact that $g(d)$ is increasing with d .

b) To prove part b) we construct an example in which $d_0 > d_W$. Suppose the investment is “unproductive”, i.e. $e_i = 0$. Then $\frac{dV^S}{di} = 0$ and $\frac{dR(i)}{di} = 0$. Therefore

$$\begin{aligned}
 \frac{dV^e(d|p=0)}{dd} &= \left[\frac{dV^S}{di} + F(d)\frac{dR(i)}{di} \right] \frac{di}{dd} + [E + R(i) - d]f(d) - F(d) \\
 &= [E + R(i) - d]f(d) - F(d) .
 \end{aligned} \tag{34}$$

$$\begin{aligned}
\frac{d^2 V^e(d|p=0)}{dd^2} &= \frac{dR(i)}{di} f(d) + [E + R(i) - d] f'(d) - 2f(d) \\
&= [E + R(i) - d] f'(d) - 2f(d) .
\end{aligned} \tag{35}$$

Suppose that $f(d)$ is constant. Then $V^e(d|p=0)$ is a concave function of d . Evaluating the first derivative of $V^e(d|p=0)$ at $d = d_W$ shows that

$$\left. \frac{dV^e(d|p=0)}{dd} \right|_{d=d_W} = [E + R(i) - d_W] f(d_W) - F(d_W) = R(i)f(E) - F(E) . \tag{36}$$

We want to construct the example such that this is strictly positive. Recall that

$$E = (1 - \mu) \{ y_1^{FB} - e(y_1^{FB}, i, \theta_1) - y_1^S + e(y_1^S, i, \theta_1) \} . \tag{37}$$

Thus, by choosing μ close to 1, we can make E and $F(E)$ arbitrarily small. Furthermore, if μ increases, then $R(i) = \mu[e(y_1^S, i, \theta_1) - e(y_1^S, i, \theta_2)]$ goes up. Since $f(\cdot)$ is constant there exists a μ close enough to one such that

$$\left. \frac{dV^e(d|p=0)}{dd} \right|_{d=d_W} = R(i)f(E) - F(E) > 0 . \tag{38}$$

Given concavity this implies that the shareholders will choose a higher level of dilution than is socially optimal. *Q.E.D.*

Proposition 6 says that in case of $p = 1$ the shareholders choose d always inefficiently low because they do not take into account the positive externality of d on the raider. Thus, some of the takeovers that would be ex post efficient (in the sense that $E > t$) do not take place. In case of $p = 0$, however, the shareholders may choose d too high and thus encourage takeovers that are ex post inefficient. The reason is that there are private gains from rent shifting which add nothing to social welfare.

It is this last effect which critics may have in mind when they claim that the intention to appropriate rents leads to socially inefficient takeovers. While this effect is presumably not very large with respect to managerial rents it may be of considerable importance if also rents of other stakeholders of the company (e.g. workers or suppliers) are on stake.

6 Conclusions

This paper shows that the impact of takeovers on the value of a company cannot be judged only on the grounds of the value increase a raider might bring about when he

actually takes over the company. The reason is that this value increase may be offset by ex ante reactions of stakeholders to anticipated takeovers, for instance by underinvesting in relationship specific assets.

We have shown that shareholders can overcome this underinvestment problem caused by takeovers by choosing the appropriate governance structure for the company. If the shareholders give up part of their residual control rights and allow the manager to use poison pills they can induce second best investments. Using additionally golden parachutes the shareholders can make sure that poison pills are never used in equilibrium and so ex post profitable takeovers can take place. This result explains why the fact that shareholders approve of poison pills and offer golden parachutes is not so puzzling after all.

However, our analysis has also made clear that shareholders may benefit from rent shifting through a higher takeover price. Thus, if the gains from rent shifting are high enough the shareholders will not choose the corporate charter which prevents underinvestment. In this case it may happen that ex post inefficient takeovers are encouraged solely for the sake of rent shifting.

Appendix

Proof of Proposition 1:

Let $\mathbf{z} = \{w_1, w_2, y_1, y_2\}$ and $\lambda = \{\lambda_1, \lambda_2, \lambda_3, \lambda_4\}$ and define the Langrangian function

$$\begin{aligned}
 L(\mathbf{z}, \lambda) = & (1 - \mu)(y_1 - w_1) + \mu(y_2 - w_2) \\
 & + \lambda_1 [w_1 - w_2 + e(y_2, i, \theta_1) - e(y_1, i, \theta_1)] \\
 & + \lambda_2 [w_2 - w_1 + e(y_1, i, \theta_2) - e(y_2, i, \theta_2)] \\
 & + \lambda_3 [w_1 - e(y_1, i, \theta_1)] \\
 & + \lambda_4 [w_2 - e(y_2, i, \theta_2)]
 \end{aligned} \tag{39}$$

By the Kuhn-Tucker Theorem (see e.g. Intriligator (1971, p.56)) we know that \mathbf{z}^* solves the maximization problem of the shareholders if there exists a λ^* , such that $(\mathbf{z}^*, \lambda^*)$ is a saddle point of the Lagrangian, i.e. if

$$L(\mathbf{z}, \lambda^*) \leq L(\mathbf{z}^*, \lambda^*) \leq L(\mathbf{z}^*, \lambda) \quad \forall \mathbf{z} \geq 0, \lambda \geq 0. \tag{40}$$

Let $\mathbf{z}^* = \{w_1^*, w_2^*, y_1^*, y_2^*\}$ as characterized in Proposition 1 and $\lambda^* = \{0, \mu, 1, 0\}$. We will show that this is indeed a saddle point of the Lagrangian and hence, that \mathbf{z}^* solves the maximization problem.

Note first that by (8) $e_y(y_1^*, i, \theta_1) < 1$, whereas by (9) $e_y(y_2^*, i, \theta_2) = 1$. Thus, $y_1^* < y_1^{FB} < y_2^{FB} = y_2^*$. Given \mathbf{z}^* , conditions IC2 and IR1 are binding whereas IC1 and IR2 are not. Thus, it is easy to check that λ^* indeed minimizes $L(\mathbf{x}^*, \lambda)$, so the second part of inequality (40) is satisfied.

To prove that the first part of (40) holds (given λ^*) we have to show that \mathbf{z}^* satisfies the first order conditions for a maximum of $L(\mathbf{z}, \lambda^*)$ and that $L(\mathbf{z}, \lambda^*)$ is concave. The FOCs are given by:

$$\frac{\partial L}{\partial y_1} = (1 - \mu) + \mu \cdot e_y(y_1, i, \theta_2) - e_y(y_1, i, \theta_1) \leq 0 \tag{41}$$

$$\frac{\partial L}{\partial y_2} = \mu - \mu \cdot e_y(y_2, i, \theta_2) \leq 0 \tag{42}$$

$$\frac{\partial L}{\partial w_1} = -(1 - \mu) - \mu + 1 \leq 0 \tag{43}$$

$$\frac{\partial L}{\partial w_2} = -\mu + \mu \leq 0 \tag{44}$$

Obviously they are satisfied with equality at \mathbf{z}^* , so the complementary slackness conditions hold as well.

To see that $L(\mathbf{z}, \lambda^*)$ is concave, we have to show that the Hessian matrix of $L(\cdot)$ is negative semidefinite. Note that by Assumption 2.1 and 2.2 we have

$$L_{y_1 y_1} = \mu e_{yy}(y_1, i, \theta_2) - e_{yy}(y_1, i, \theta_1) < 0 \quad (45)$$

$$L_{y_2 y_2} = -\mu e_{yy}(y_2, i, \theta_2) < 0, \quad (46)$$

while all the other second derivatives vanish.

Finally, note that $\frac{\partial w_1^S}{\partial i} < 0$ by Assumption 2.3, $\frac{\partial w_2^S}{\partial i} < 0$ by Assumptions 2.3 and 2.5 and $\frac{\partial y_1^S}{\partial i} = \frac{\partial y_2^S}{\partial i} = 0$ by Assumption 2.5. Q.E.D.

Proof of Proposition 3:

Suppose the raider offers $\pi < \frac{V^T - d}{N}$. The individual shareholder strictly prefers not to tender if the majority of all shareholders tenders, and he is indifferent if the majority does not tender. Thus, to hold out is the only undominated strategy. The raider's payoff is $\Pi = -t$, so $\pi < \frac{V^T - d}{N}$ cannot have been optimal.

Suppose the raider offers $\pi = \frac{V^T - d}{N} + \epsilon$, $\epsilon > 0$. In this case each individual shareholder weakly prefers to tender and the raider's payoff is

$$V^T - N \cdot \left(\frac{V^T - d}{N} + \epsilon \right) - t = d - N \cdot \epsilon - t. \quad (47)$$

However, for any given positive ϵ there exists a smaller ϵ' which would have yielded a higher payoff. So the only equilibrium candidate offer is $\pi^* = \frac{V^T - d}{N}$. Given π^* all shareholders are indifferent no matter what the other shareholders are doing. But π^* can be part of an equilibrium only if it is accepted for sure by at least $n > \frac{N}{2}$ shareholders. Otherwise the raider would have done better offering slightly more. Hence the only subgame perfect equilibrium outcome is that the raider offers $\pi^* = \frac{V^T - d}{N}$ and at least $n > \frac{N}{2}$ shareholders accept. Note that the raider's payoff

$$n \cdot \left(\frac{V^T}{N} - \pi^* \right) + \frac{N - n}{N} \cdot d - t = \frac{nd}{N} + d - \frac{nd}{N} - t = d - t \quad (48)$$

is independent of n . Furthermore, the equilibrium payoff of each shareholder is $\frac{V^T - d}{N}$ no matter whether he tenders or not. Q.E.D

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